SECTION 11612

FUME HOODS

****

LANL MASTER CONSTRUCTION SPECIFICATION

When editing to suit project, author shall add job-specific requirements and delete only those portions that in no way apply to the activity (e.g., a component that does not apply). To seek a variance from applicable requirements, contact the LEM Mechanical POC.

When assembling a specification package, include applicable specifications from all Divisions, especially Division 1, General Requirements.

Information within "stars" is provided as guidance to the author responsible for revising the specification. Delete information within "stars" during editing.

This specification serves as a template. The specification was prepared by an organization operating under a quality assurance program that meets the requirements of 10 CFR 830 (suitable for ML-1 through ML-4 projects). Implementation of this specification requires modification to the specification to meet project-specific requirements. Responsibility for application of this specification to meet project-specific requirements lies with the organization modifying or implementing the specification. The organization modifying the specification shall apply a graded approach to quality assurance based on the management level designation of the project. When this specification is used with nuclear facilities subject to 10 CFR 830, modification to this specification must be performed by an individual or organization operating under a quality assurance program that meets the requirements of that CFR.

The specification requirements stated herein are dependent upon specific knowledge of the system, structure and component's safety functions and interaction with other systems, structures, and components. The author of this section shall consider and apply additional safety requirements based upon knowledge of the system, structure, and component's specific safety function as related to the project and facility. These requirements include those addressed in documents TA-55-WI-004, "Working in PF-4 Hoods," TA-55-WI-025, "Decommissioning and Removing of Gloveboxes and Hoods in PF-4, TA-55," and hood related issues in nuclear facilities such as exhaust tie-in, primary exhaust, secondary exhaust, hazard control, plans, required training, Material Control & Accountability, waste management, required records, etc.

****

PART 1 GENERAL

1.1 SUMMARY

This section establishes the requirements for the specification of laboratory fume hoods.

A. SECTION INCLUDES

1. Laboratory Fume Hoods, including constant airflow volume open bypass hoods, variable airflow volume restricted bypass hoods, and special purpose hoods. Equipment provisions for ADA compliance are specified where applicable.

B. PRODUCTS SUPPLIED

1. Based on fume hood design, furnish and install all fume hoods and related understructures as specified and/or as shown on drawings.

2. Furnish and deliver all service outlets, accessory fittings, electrical receptacles and switches, as listed in this specification, equipment schedules, or as shown on drawings.

3. Pre-install fittings for attachment to the fume hood superstructure at the factory.

4. Pre-plumb plumbing fixtures mounted on the fume hood superstructures per section 2.2.K. Pre-wire electrical fixtures per section 2.2.L.

****

Edit applicable related sections and divisions listed below to meet project requirements associated with the fume hood.

****

C. Related Sections

1. Section 01015: LANL/Contractor Furnished Property and Services

2. Section 01330: Submittal Procedures

3. Section 01600: Material and Equipment

4. Section 01700: Contract Closeout

5. Section 13085: Seismic Protection

1.2 REFERENCES

Codes, specifications, and standards referred to by number or title form a part of this specification to the extent required by the following references and others that may exist in this document. Use codes, specifications, and standards referenced below of the latest revision at the time of award of contract, unless otherwise stated below.

A. 10 CFR 830.122: Nuclear Safety Management Quality Assurance Criteria

B. ASHRAE Standard 110: Method of Testing Performance of Laboratory Fume Hoods

C. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials

D. DOE-STD-1020: Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities

E. DOE-STD-1021: Natural Phenomena Hazards Performance Categorization Guidelines for Structures, Systems, and Components

F. HSR-5-LIHSM-01: Ventilation Chemical Laboratory Fume Hood Testing, Los Alamos National Laboratory Industrial Hygiene and Safety Group Laboratory Health and Safety Manual

G. LANL Engineering Manual

H. LANL Memorandum ESA-EA:99-015

I. LANL Supplier Deviation Disposition Request

J. NFPA 255: Standard Method of Test of Surface Burning Characteristics of Building Materials

K. NMT-AP-011: Receipt Inspection of Items and Materials

L. SEFA 2.3: Installation of Scientific Laboratory Furniture and Equipment-Recommended Practices

M. UL 723: Test for Surface Burning Characteristics of Building Materials

1.3 DEFINITIONS AND ACRONYMS

A. Access Opening: Part of a fume hood through which work is performed; entrance; sash or face opening. Also an opening that allows service access to components normally hidden behind obstructions, structure, or panels.

B. ADA: Americans with Disabilities Act

C. AI: As installed

D. Airfoil: Curved, angular, shaped, or streamlined member at the fume hood entrance and horizontally oriented across the lower part of the fume hood access opening. Shaped to provide a smooth airflow into the fume hood interior across the work surface. Type of fume hood with streamlined members at entrance opening.

E. AM: As manufactured

F. ANSI: American National Standards Institute

G. ASHRAE: American Society of Heating, Refrigerating, and Air Conditioning Engineers

H. Baffle: Panels located across hood interior back wall which control and direct the pattern of airflow moving through the hood.

I. Bypass: Compensating opening that functions to maintain constant volume fume hood exhaust, regardless of sash position, and limit the maximum face velocity as the sash is raised or lowered.

J. Casework: A generic term for base and wall cabinets, display fixtures, and storage shelves. Generally includes the tops and work surfaces.

K. Certificate of Conformance: Certificate of Conformance: A supplier's certification that is traceable to the shipment, the items, or materials and states that the materials conform in all respects with the purchase order requirements. This certificate is signed or otherwise authenticated by the supplier's authorized representative. The responsible person within the manufacturing organization signs and authenticates the CoC and certifies the conformance of all items shipped to purchase-order requirements [NMT: Refer to NMT-AP-011].

L. CFR: Code of Federal Regulation

M. CoC: Certificate of Conformance

N. Combination Sash: A fume hood sash with a framed member that moves vertically housing two or more horizontally sliding transparent viewing panels.

O. Damper: Device installed in a duct to control airflow volume.

P. DBE: Design Basis Earthquake

Q. DOE: Department of Energy

R. Duct: Round, square, or rectangular tube used to enclose moving air.

S. Entrance: Front or access opening of fume hood.

T. Exhaust Collar: Place where exhaust duct connects to fume hood and through which all exhaust air passes.

U. Face Opening: Front access or sash opening of a fume hood. Also see sash or access opening.

V. Face Velocity: Average velocity of air moving through the fume hood entrance or access opening and perpendicular to the hood face. Usually expressed in FPM and measured at the plane of the face opening.

W. Hood Face: The plan of minimum area at the front portion of a laboratory fume hood through which air enters when the sash(es) is (are) fully opened, usually in the same plane as the sash(es) when sash(es) are present.

X. Horizontal Sash: A fume hood sash with typically two or more framed panels that slide horizontally across the hood opening.

Y. LANL: Los Alamos National Laboratory, operated by the University of California for the Department of Energy.

Z. Make-Up Air: Air needed to replace the air taken from the room by fume hoods and other air exhausting devices.

AA. NFPA: National Fire Protection Association

BB. NMT: Nuclear Materials Technology

CC. Plenum: A chamber used to equalize airflow.

DD. QA: Quality Assurance

EE. Rough-In: Location for point of connection of plumbing, electrical, or mechanical services within the casework service tunnel/chase. Located within fifteen feet, or as stated by local codes, whichever is less, of the final fixture location.

FF. Sash: A moveable glazed panel or door set in the hood entrance or access opening to form a protective shield and to control the face velocity of air into the hood.

GG. Sash Opening: See face or access opening.

HH. SEFA: Scientific Equipment and Furniture Association

II. Service Fittings: Include oxygen, gas, air, vacuum, and steam cocks; turrets; hot, cold, and distilled water faucets; remote controlled valves; filter pumps; vacuum breakers; eye-washers; showerheads; steam cones and steam baths; sinks, cup sinks, traps, and plaster traps.

JJ. Service Fixtures: Include electrical convenience outlet boxes, electrical pedestals, “C” type conduits, single or duplex VAC or VDC receptacles; switches, variable voltage units, and fluorescent tubes.

KK. Service Tunnel or Chase: Area in back of or between the backs of base cabinets and under the working surfaces to allow room for service lines.

LL. SPL: Static Pressure Loss

MM. Standard Hood: Similar to a Constant Airflow Volume Open Bypass Hood. Sash may be vertical, horizontal, or combination type.

NN. Static Pressure: Measurement of resistance created when air moves through a duct or hood; expressed in inches of water.

OO. Static Pressure Loss: Measurement of resistance created when air moves through a duct or hood, usually expressed in inches of water.

PP. Superstructure: Portion of a fume hood that is supported by the work surface.

QQ. UL: Underwriters Laboratories

RR. VAV: Variable Airflow Volume

SS. Vertical Sash: A fume hood sash with one or more framed panels that slide up and down/vertically across the hood opening to a height required by the operator.

TT. Work Space: That part of a fume hood interior where apparatus is set up and fumes are generated. It is normally confined to a space extending from six inches behind the sash plane to the face of the baffle, and extending from the work surface up to a plane parallel with the top edge of the access opening.

****

Edit applicable sections listed below to meet project requirements associated with the fume hood.

****

1.4 DESIGN AND PERFORMANCE REQUIREMENTS

A. Fume hoods specifically function as ventilated, enclosed work spaces designed to capture, confine, and exhaust fumes, vapors, and particulate matter produced or generated within the enclosure.

B. Face velocities of fume hoods are established on the basis of the toxicity or hazard of the materials used or the operations conducted within the fume hood. A categorization of fume hood types based on face velocities and materials handled is as follows:

1. Class A Fume Hoods: Used for materials of extreme toxicity or hazard such as tetraethyl lead, beryllium compounds, metal carbonyls, and volatile carcinogens. The recommended average face velocity is 125 to 150 FPM with corresponding minimums of 100 to 125 FPM.

2. Class B Fume Hoods: Used for most materials and operations in the laboratory. The recommended average face velocity is 100 FPM with a minimum of 80 FPM.

3. Class C Fume Hoods: Used for materials or operations where the hazard is not high and may be used for low toxicity materials such as acetone, ethanol, straight chain hydrocarbons, and for operations creating nuisance dusts and fumes. The recommended average face velocity is 75 to 80 FPM with corresponding minimums of 50 to 60 FPM.

C. Provide fume hoods of types listed below with airfoil design to ensure maximum operating efficiency and containment. Foil sections at the front fascias of the hood minimize the eddying of air currents at the hood face opening while the rear baffle system minimizes turbulence in the rear and upper portion of the hood interior.

D. Hood operates on a once through airflow mode with no air recirculation back to any operating zone. Configure the hood such that no equipment can be placed within the first six inches inside the hood or placed in a way that will create an undesirable air current.

E. Provide fume hoods with consistent and safe airflow through the hood face. Ensure that variations of face velocity do not exceed 20% of the average face velocity at any designated measuring point.

F. Assure minimal SPL via adequate baffle slot area and exhaust collar configuration.

G. Maximum allowable variation throughout the range of baffle adjustment is +/- 5% for exhaust CFM, static pressure, and average face velocity at any baffle position.

H. Provide “dead man” features that would automatically return valves, controls, and switches to a safe position for those valves, controls, and switches affecting processes that could create hazards due to operator inattention or incapacitation.

I. Ensure that the average illumination of the work area is 80 foot-candles minimum. The work area is defined as the area inside the superstructure, from side to side and from face of baffle to the inside face of the sash, and from the working surface to a height of 28 inches above the work surface.

J. For fume hood interior materials, use only materials with a flame spread rating of less than 25 when tested in accordance with NFPA 255 or as otherwise specified.

K. Minimum dimensions: [Specify based on project requirements and fume hood type]. Verify that the hood will pass through a standard 3 ft x 7 ft doorframe with doorstops.

L. Fume Hood Types

1. Constant Airflow Volume Open Bypass Hood:

a. This type of hood exhausts a constant airflow volume regardless of sash position and will automatically bypass air above and below the sash opening as the sash is lowered.

b. This type of hood permits exact balancing of the room ventilating system by maintaining a constant volume of hood exhaust airflow.

c. The upper bypass functions automatically by opening as the sash is lowered and allows bypass air to enter the hood through a low impedance grille.

d. The lower bypass, located below the bottom airfoil sill, vectors air in a manner that continuously purges the work surface area.

e. The bypass system design limits face velocity increases to not more than three and one-half times the face velocity with the sash fully open.

2. Variable Airflow Volume Restricted Bypass Hood:

a. Hood exhaust airflow volume varies proportionally to the sash position when used with a hood face velocity controller system (supplied by others). This type of hood exhausts the maximum airflow volume when the sash is fully open and the minimum airflow volume when the sash is completely closed.

b. Use of an independent VAV controller (supplied by others) is required. Properly installed, the VAV controller adjusts the blower motor speed or a balance damper to compensate for the sash position in order to maintain a constant face velocity.

c. Correlate with other VAV controllers in the room air supply system to ensure proper room balance. Restrict the air bypass per the VAV manufacturer’s recommendation.

d. Ensure that the bypass system flows a minimum of 20% of total airflow volume with the sash closed to maximize containment and achieve proper dilution.

M. Special or Specific Purpose Hoods

1. Hoods designed for specific laboratory applications, or hoods that provide unique features.

a. Perchloric Acid Hood: For safe handling of perchloric acid.

b. Isotope Hood: Designed for handling radioactive isotopes.

c. Combination Hood: Providing both a work surface and walk-in area in one hood.

d. California Hood: Providing sash openings (usually horizontal) on multiple sides of the hood work surface for enclosing large or complex apparatus.

e. Walk-In Hood: Providing sash configuration openings and hood interiors that extend to the floor for enclosing large or complex apparatus.

f. Distillation Hood: Providing extra depth and 1/3 to 1/2 height benches for enclosing tall distillation apparatus.

g. Bench Hood: A fume hood that is located on a work surface.

N. Seismic Design

1. Depending upon the quantity and characteristics of the materials being contained and the location of the fume hood installation within the LANL facility, provide fume hoods to withstand a DBE.

2. Ensure that the fume hood and its anchorage are in accordance with applicable performance category requirements stated in the LANL Engineering Manual Structural Chapter, DOE-STD-1020, DOE-STD-1021, LANL memorandum ESA-EA:99-015 and similar documents, Section 13085 Seismic Protection, and other LANL Technical Area specific documents.

1.5 SUBMITTALS

A. Submit in accordance with Sections 01330, Submittal Procedures and 01700, Contract Closeout.

B. Product Data

1. Catalog or manufacturer's data for each fume hood component and associated equipment specified. Include design features, configurations, total CFM flow capacity, component dimensions, weight, furnished accessories, standard materials, construction details, utility and service requirements, and colors for each type of fume hood.

2. Materials/parts list

C. Shop Drawings

1. Shop drawings indicating component dimensions, tolerances, equipment locations, large scale plans, elevations, ends, cross sections, mechanical/electrical rough-in and anchor placement dimensions, clearances for maintenance and operation, size and location of field connections, construction details, utility requirements, service run spaces, and materials used

2. Wiring diagrams

D. Samples

1. Hood interior lining, 6" x 6" sample.

2. Hood enclosure of color selected, 6" x 6" sample.

3. Work surfaces, 6" x 6" sample.

4. Other pre-finished equipment and accessories, 6" x 6" or appropriately sized sample.

5. Operation signs, placards, and/or instruction plates that will be attached to hood.

E. Test Reports and Certificates

1. Provide certification (CoC or other equivalent document) that the fume hood was designed and factory tested in accordance with ASHRAE Standard 110.

2. Provide UL Standards for Safety listing for the fume hood superstructure.

3. Provide test reports on each size and type of hood verifying conformance to specified parameters and regulations. A test report accompanies each hood as part of the installation and usage package. Include performance data curves and documentation that fume hoods meet the performance requirements described in ASHRAE Standard 110 and this specification.

4. Provide certification that the fume hood has been through start-up procedures and that it is functioning properly.

5. Provide test report on operation of installed fume hood after installation.

F. Manufacturer's Instructions

1. Manufacturer's installation and assembly instructions showing the field installation of parts, components, equipment, and other similar items.

2. Written instructions providing details on proper operation and maintenance.

G. Closeout Submittals

1. Submit in accordance with Sections 01330 and 01700.

1.6 QUALITY ASSURANCE

A. Use products of a company that has:

1. Manufactured at least 50 fume hoods of the same type and size specified.

2. Five years or more experience in the manufacture of laboratory fume hoods, casework, and equipment of type specified.

3. Records of manufacturing facility, testing facility, assembly, and quality control procedures available for LANL inspection.

4. A QA program meeting the requirements of 10 CFR 830.122.

B. Provide fume hoods with performance conforming to related ANSI, ASHRAE, UL, and LANL requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Transport, handle, store, and protect product in accordance with the requirements of Section 01600.

B. Deliver equipment to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating equipment name, part numbers, quantities, and manufacturer.

1.8 WARRANTY

A. The selected manufacturer warrants all products sold to be free from defects in material and workmanship for a period of one-year minimum, or as negotiated within contract, (beginning with date of acceptance). LANL shall provide notification to the manufacturer's representative of any defective product and provide the manufacturer a reasonable opportunity to inspect the goods. LANL shall not return defective products without written shipping instructions and authorization from the manufacturer.

1.9 COMMISSIONING

A. Provide labor, materials, and equipment to perform the commissioning process.

PART 2 PRODUCTS

2.1 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Comply with Section 01630, Product Options and Substitutions.

2.2 MANUFACTURERS

A. Listed below are companies with suitable experience specializing in the design and manufacture of laboratory fume hoods. Other companies may qualify provided they have suitable experience performing similar work:

1. Fisher Hamilton Incorporated: SafeAire Fume Hoods
2. Kewaunee Scientific Corporation: Supreme Air Fume Hoods

B. Supply all equipment in accordance with this specification. The offering of a product differing in materials and construction from this specification requires written approval via LANL Supplier Deviation Disposition Request and demonstrate equivalent or superior performance. Obtain alternate product approval no less than seven (7) days before the proposal deadline.

C. LANL reserves the right to reject qualified or alternate proposals and to award based on product value where such action assures equivalent or greater integrity of product.

2.3 MANUFACTURED UNITS

A. Fume Hood Superstructure Frame:

1. A freestanding rigid frame structure of steel angle provided to support exterior and interior liner and baffle panels.
2. Exterior steel panels can be removed without disassembly of the frame structure and inner liner panels.

B. Fume Hood Interior Walls:

1. Provide double walled ends to maximize interior working area. The area between the double walled ends houses the remote control valves, sash counterbalance weights, electrical receptacles, and wiring.
2. To allow for plumbing and electrical system maintenance and replacements, provide removable interior liner access panels that can be removed without disassembly of the superstructure frame and exterior steel panels.

3. Contour the front vertical fascia section at the front leading edge to provide a streamlined hood air entrance section and ensure smooth even flow of air into the hood. The vertical fascias house the required service controls, electrical switches and receptacles.

4. Provide hood interior end panels and sash track flush with the fascia to prevent eddy currents and back flow of air.

C. Fume Hood Exteriors:

1. Construct from cold rolled steel with component parts screwed together to allow removal of the end panels, front end and top fascia pieces, and airfoil strips for replacement or to afford access to the plumbing lines, service fittings, and electrical components.

2. Weld spacers or reinforcements to the exterior parts as required.

D. Fume Hood Finish:

1. Pre-treat steel component parts after welding/fabrication, but before final assembly, to provide a uniform fine-grained crystalline phosphate surface that will enhance both the final finish bond and final finish resistance to humidity, corrosion, and corrosive chemicals.

2. Physically and chemically clean the steel by degreasing and washing with an alkaline cleaner then follow with a complete metallic phosphate solution spray treatment. After the phosphate treatment, completely dry the steel.

3. Apply a corrosion-resistant primer base coat using an electro deposition dip procedure to guarantee complete paint coverage. Powder-coat or solvent-based spray paints are unacceptable for the initial base paint coat. Cure the coating by baking at elevated temperatures to provide maximum properties of corrosion and wear resistance.

4. Provide an acid, alkali, and solvent resistant final topcoat finish on both exterior and interior surfaces of all parts.

E. Fume Hood Airfoil:

1. Provide an integral airfoil, streamlined similar to the sides, at the bottom of the hood opening. Provide a nominal 1" open space between the foil and the top front edge of the work surface to direct an airflow stream across the work surface, to prevent the back flow of air, and to purge the work surface airspace of contaminants. Extend the airfoil back under the sash, so that the sash does not close the 1-inch opening.

2. Fabricate the foil from 12-gauge minimum thickness steel to provide rigidity and to resist denting and flexing.

3. For walk-in hoods, provide a stop located at the bottom of the sash track that will ensure a nominal 1 inch opening between the bottom of the sash and the floor.

F. Fume Hood Top Panel:

1. The top front panel of the hood may have an integral 1/4" thick laminated safety float glass or polycarbonate vision panel located directly above the sash opening and in such a manner as to allow viewing the top interior portion of the hood without having the operator stoop or place their face inside the hood.

2. For Constant Airflow Volume Open Bypass Hoods:

   a. Provide an integral grille that will bypass airflow at the top of the sash opening. The bypass will operate passively and will not rely on mechanical or electrical means to perform its function.

G. Fume Hood Baffles:

1. Provide a baffle system with three horizontal slots designed to facilitate airflow distribution through the hood. Position horizontal slots at the low, mid, and upper sections of the hood interior back wall. Baffles may be adjustable or fixed depending on system specification and intended application. Ensure that the baffle system design does not allow back flow of air through a hood when the hood sash is closed.

2. Ensure that a fixed baffle system accommodates the airflow management requirements for specified contaminant properties. Provide acid-resistant labeling indicating the specific contaminant properties that the baffle system is configured for (i.e. lighter than air or heavier than air gases or fumes, high heat generation processes, or general conditions).

3. For an adjustable baffle system, provide adjustability that will accommodate the airflow management requirements for various contaminant properties. As a minimum, provide adjustability for the top and bottom slots. When specified, provide a single-point remote baffle adjustment device that will allow convenient and prompt adjustment from either the hood exterior or from no further than 6" into the hood. Locate the baffle adjustment device such that it will not require the entry of the operator's head into the hood and so that it will be accessible by both able bodied and wheelchair bound operators. Provide acid-resistant labeling indicating proper baffle adjustment position for various contaminant properties.

4. Provide removable baffles to facilitate cleaning.

H. Fume Hood Duct Collar:

1. Provide polyethylene or stainless steel bell-mouthed duct collar(s) located in the hood plenum chamber.

I. Fume Hood Lighting:

1. Provide fluorescent or incandescent light fixtures in the top of the hood. Locate lighting power switch so that it is operable by both able bodied and wheelchair bound operators. Ensure that the average illumination of the work area is 80 foot-candles minimum.

2. Ensure that all fixtures are UL approved and labeled.

3. Provide fluorescent lights with T-8 bulbs.

4. Provide electronic ballast for fluorescent light fixtures.

5. Isolate the fluorescent light fixtures from the hood interior by a 1/4" thick tempered glass, safety glass, or polycarbonate panel sealed from the hood cavity. Ensure that bulb replacement is accomplished from the hood exterior only.

6. Provide incandescent fixtures with vapor proof lamps and shatterproof globes.

7. Provide explosion proof lighting when specified.

J. Fume Hood Sash

1. Provide a vertical, horizontal, or combination sash as specified.
2. Produce sash frame from 18-gauge steel with mitered and welded corners ground smooth to provide a complete unit with no visible joints. Use replaceable plastic guides for the sash frames that will operate in stainless steel sash guides to prevent metal-to-metal contact.
3. Provide sash tracks set flush with the interior liner panels to minimize turbulence.
4. Produce the sash glass from 1/4" laminated safety float glass or polycarbonate panels.
5. Set glass/polycarbonate panels into deep form extruded polyvinyl chloride, or equivalent, channels internally interlocked with the outer member sealing and retaining the glazing.
6. Provide rubber bumper stops for the sash to open and close against.
7. Counterbalance System:
    a. Counter balance up/down moving (vertical or combination) sashes with a weight and cable/chain system designed to prevent sash tilting and binding during operation. Permit one finger operation at any point on the sash pull.
    b. Ensure that the system will hold the sash at any position without creep and will prevent sash drop in the event of cable/chain failure.
    c. Provide stainless steel sash cables operating on ball bearing pulleys/sheaves. Provide stainless steel sash chains operating on ball bearing sprockets.
    d. Do not use spring type counterbalances.

K. Fume Hood Plumbing Services

1. Provide all plumbing fittings factory installed and piped between the valve, outlet, and service inlet. Provide inlet piping with a labeled single-point connection located on the hood exterior for each valve and route to a point that will best suit rough-in locations shown on the drawings.
2. Provide remote controlled valves, as selected, located within the end panels and actuated by chrome plated 4-armed handles attached to brass extension rods that project through control panels located in the hood vertical fascias. Furnish the valve handles with color-coded and labeled service indicators.
3. Locate all services so that they are reachable by both able bodied and wheelchair bound operators.
4. For interior fittings supplying gases and water, provide nylon panel flanges and nylon angle serrated hose connectors, color-coded to match services. For distilled water interior fittings, provide tin lined bronze panel flanges and angle serrated hose connectors with white color-coding. For steam interior fittings, provide cast bronze flanges and angle serrated hose connectors with a chemical resistant metallic bronze finish. Provide water goosenecks in cast bronze with a chemical resistant metallic bronze finish.

L. Fume Hood Electrical Services

1. Pre-wire the hood superstructure and provide a UL label certifying acceptable wire gauge, connections, fixtures, and wire color coding.

2. Locate all frequently operated services so that they are reachable by both able bodied and wheelchair bound operators.

M. Hood Work Surface

1. Epoxy Resin:

   a. Use molded epoxy resin made in the form of a watertight pan of 3/8" minimum depth with a 6" wide safety ledge across the front edge.

   b. When water service is supplied, provide a cup drain flush with the recessed portion of the work surface.

2. Stainless Steel:

   a. Use 14-gauge, type 304 stainless steel with a No. 4 finish made in the form of a watertight pan of 1/2" minimum depth with a 6" wide safety ledge across the front edge.

   b. When water service is supplied, provide a cup drain flush with the recessed portion of the work surface.

   c. Reinforce to support a uniform maximum loading of 200 pounds per square foot.

N. Fume Hood Liners

1. Epoxy Resin:

   a. Use 1/4" thick sheets with maximum flame spread of 6.2 per ASTM E84.

   b. Fasten epoxy resin liner panels using stainless steel screws with plastic covered heads.

   c. Fiberglass reinforced plastics or polyesters are not acceptable substitute liner materials for epoxy resin.

2. Reinforced Polyester Lining:

   a. Use 1/4" thick fiberglass reinforced polyester sheet with smooth finish, maximum flame spread of 15 per UL 723 and ASTM E84.

   b. Fasten reinforced polyester liner panels using stainless steel screws with plastic covered heads.

3. Cement Board:

   a. Use 1/4" thick, dense, monolithic sheet with a chemically resistant, inorganic, non-asbestos mixture of fiber cement. Maximum flame spread of 0 per ASTM E84.

   b. Coat surfaces exposed to the hood interior with a white epoxy finish.

   c. Fasten cement board liner panels using non-corrosive fasteners.

4. Reinforced Phenolic Resin:

   a. Use 1/4" thick sheet made from a compression molded cellulose fiber reinforced phenolic resin core with integrally cured melamine surfaces.

   b. Fasten reinforced phenolic resin liner panels using stainless steel screws with plastic covered heads.

5. Stainless Steel

a. 16-gauge, type 304 stainless steel with a No. 4 finish fastened in place with stainless steel screws.

O. Fume Hood Monitors and Alarms

1. Provide a safety monitoring and alarm system that monitors:

a. Hood face velocity and provides audible and visual alarms when face velocity drops below or rises above user specified face velocities.

b. Hood exhaust duct static pressure and provides audible and visual alarms when pressure limits are exceeded.

c. The audible alarm is mutable via a panel mounted manually operated switch that is accessible by both able bodied and wheelchair bound operators. The visual alarm continues to flash as long as the alarm condition exists.

2. Face Velocity Alarm:

a. Monitors the actual face velocity of the hood regardless of sash position and is UL approved and labeled.

3. Low Static Pressure Alarm:

a. Monitors the static pressure in the exhaust duct above the hood regardless of sash position and is UL approved and labeled.

4. Passive Indicating Devices

a. Equip each hood with a manometer or other passive pressure-measuring device to provide the user visual indication that the hood is operating within acceptable parameters.

b. Provide a passive airflow indicating device to provide the user visual indication that the hood is providing adequate airflow and operating within acceptable parameters.

c. Locate passive indicating devices so that they are easily and readily visible to both able bodied and wheelchair bound operators.

P. Perchloric Acid Hoods

1. A fume hood equipped with wash down washers, integral work surfaces, coved corners, and non-organic lining materials.

2. Fabricate hood interior lining, including end panel and back panel, from 16-gauge, type 316 stainless steel with a No. 4 finish. Fabricate the inside back and end panels in a seamless, welded, wrap around design that is welded to the work surface. Fabricate all vertical and horizontal corners and seamless joints between inside back, end panels, and work surfaces with 1/2" internal radius. Grind all welds flush and blend to a No. 4 finish. Reinforce the entire stainless steel hood interior to provide a completely rigid, welded together, self-supporting assembly. Provide the hood end liners without access openings.

3. Fabricate hood work surface from 14 gauge, type 316 stainless steel with a No. 4 finish in the form of a watertight pan 1/2" deep with a 6" wide safety ledge at the front edge and an integral, continuous trough sink across the full width at the back of the work surface. Provide, within the trough sink, two 1-1/2" waste outlets to drain wash down system water.

4. Fabricate baffles and top panel from 16 gauge type 316 stainless steel with a No. 4 finish. Fasten the baffle to the hood interior with stainless steel screws. Provide easily removable baffles to facilitate cleaning of the baffles and the area behind the baffles.

5. Provide a wash down system that includes a remote controlled perforated spray pipe to wash down rear surface of the hood interior behind the baffles and a remote controlled water fitting.

6. Provide the hood with a label stating "For Perchloric Acid Operations Only".

Q. Isotope Hoods

1. A fume hood with integral work surface, coved corners, linings impermeable to radioactive materials, and structure reinforced to support lead shielding bricks.

2. Provide interior construction that prevents radioactive material buildup and allows complete cleaning.

3. Fabricate hood interior lining, including end panel and back panel, from 14-gauge, type 304 or 316 stainless steel with a No. 4 finish. Fabricate the inside back and end panels in a seamless, welded, wrap around design that is welded to the work surface. Fabricate all vertical and horizontal corners and seamless joints between inside back, end panels, and work surfaces with 1/2" internal radius. Grind all welds flush and blend to a No. 4 finish. Reinforce the entire stainless steel hood interior to provide a completely rigid, welded together, self-supporting assembly. Provide the hood end liners without access openings.

4. Fabricate hood work surface from 14 gauge, type 304 or 316 stainless steel with a No. 4 finish in the form of a watertight pan 1/2" deep with a 6" wide safety ledge at the front edge. Reinforce the work surface to support a uniform maximum loading of 200 pounds per square foot.

5. When water service is supplied, provide a cup drain flush with the recessed portion of the work surface.

6. Fabricate baffles and top panel from 16 gauge, type 304 or 316 stainless steel with a No. 4 finish. Fasten the baffle to the hood interior with stainless steel screws. Provide easily removable baffles to facilitate cleaning of the baffles and the area behind the baffles.

2.4 SOURCE QUALITY CONTROL

A. Containment Performance Testing

1. Purpose: To pre-qualify the performance of the bidder's laboratory fume hood before award of contract or before acceptance of the hood after award of contract.

2. Modifications to the hood, placement of new large equipment, or equipment that creates heat or mechanical air disturbances that would alter the airflow characteristics within the hood require retesting for confinement capability before the hood is placed in service.

3. Test Method

a. Conduct pre-qualification testing of fume hoods per ASHRAE Standard 110 at the bidder's fume hood test facility. Conduct tests in the ASHRAE defined AM mode by personnel cognizant of the recommended test procedures. Refer to ASHRAE Standard 110 for specific requirements, procedures, and qualification criteria.

b. Conduct AI testing of fume hoods at LANL per ASHRAE Standard 110 and HSR-5-LIHSM-01 guidance.

c. Use the following tests to judge the performance of the fume hood:

i. Face Velocity Test

ii. Flow Visualization Test

iii. Large Volume Flow Test

iv. Tracer Gas Test

v. Sash Movement Test

PART 3 EXECUTION

3.1 EXAMINATION

A. Certify that building conditions are conducive to the installation of a finished goods product, including all critical dimensions, with LANL.

B. Inspect areas and conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting the performance of the fume hood. Ensure the area is free of undesirable air currents that would adversely affect hood performance.

C. Inspect utility rough-ins to verify actual locations of connections prior to beginning installation.

D. Check and verify that no irregularities exist that would affect quality of execution of work specified.

E. Notify the LANL if existing conditions will affect acceptable results.

3.2 INSTALLATION

A. Reference SEFA 2.3 for fume hood installation information and guidelines.

B. Arrange installation of fume hoods to provide access space for service and maintenance.

C. Coordinate work with the schedule and requirements of other work being performed in the area at the same time both with regard to mechanical and electrical connections to and in the fume hoods and the general construction work.

D. Coordinate work between LANL and the manufacturer/contractor per Section 01015. Final plumbing and electrical connections are the responsibility of those contractors fulfilling requirements of Divisions 15 and 16.

E. Assemble and install fume hoods in accordance with approved shop drawings and manufacturer's installation instructions. Ensure that fume hood assembly and installation are performed by or supervised by fume hood manufacturer personnel.

F. Install fume hoods, plumb, level, square, with no distortion, and securely anchored to building and adjacent furniture in proper location.

G. Install fume hood equipment to provide maximum safety and continuity of operation in the event of seismic activity per requirements defined in section 1.4.N.

H. Secure work surfaces to casework and equipment components with material and procedures recommended by the manufacturer.

I. Install accessories and fittings in accordance with manufacturer's recommendations.

3.3 FIELD QUALITY CONTROL

A. Site Tests, Inspection

1. Arrange for a factory authorized service representative to inspect the field assembly and installation of the fume hoods, including piping, ductwork, and electrical connections; and to prepare a written report on findings with recommended corrective actions.

2. Conduct AI testing of fume hoods at LANL per ASHRAE Standard 110 and HSR-5-LIHSM-01 guidance. Perform tests in field to verify proper operation of the fume hood before placing into service. Perform tests only after installation is complete, the building make-up air system is in operation, the building ventilation system has been balanced, all connections have been made, the doors and windows are in normal operating position, all other hoods and exhaust devices are operating at designed conditions, and written verification has been submitted that the aforementioned conditions have been met.

3. Correct any discrepancies, errant processes, or unsafe conditions disclosed by these tests before request of test procedures.

4. Project substantial completion shall be withheld until all required fume hood certification letters, tests, and reports have been submitted and approved.

B. Manufacturers' Field Services

1. Ensure that the fume hood manufacturer field tests a random sample of 20% of the installed units per ASHRAE 110 to a control level of Al 0.01 ppm or better.

3.4 ADJUSTING

A. Adjust sash, baffles, fixtures, accessories, and other moving or operating parts for proper function and operation.

B. Repair or remove and replace defective work as directed by LANL.

C. Reference Section 01700 for additional detail.

3.5 CLEANING

A. Remove all debris, dirt, packing materials, and rubbish accumulated as a result of the installation of the fume hoods to an on-site container provided by LANL or others, leaving the premises clean and orderly.

B. Clean fume hood interior and exterior to remove foreign material and construction dirt.

C. Reference Section 01700 for additional detail.

3.6 DEMONSTRATION

A. Provide written and oral instructions that detail proper operation and maintenance.

B. Reference Section 01700 for additional detail.

3.7 PROTECTION

A. Provide necessary protective measures to prevent casework and equipment from being exposed to and damaged from other construction activity.

B. Advise LANL of procedures and precautions for protection of material, installed laboratory casework, and fixtures from damage by work of other trades.

END OF SECTION

****

Do not delete the following reference information.

****

FOR LANL USE ONLY

This project specification is based on LANL Master Construction Specification Rev. 0, dated December 5, 2002.